Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent unit of MAHE, Manipal)

FOURTH SEMESTER B.TECH. (E & C) DEGREE END SEMESTER EXAMINATION
APRIL/MAY 2019
SUBJECT: ANTENNAS (ECE -2201)

TIME: 3 HOURS **MAX. MARKS: 50**

Instructions to candidates
- Answer **ALL** questions.
- Missing data may be suitably assumed.

1A. A λ/2 dipole, with total loss resistance of 1 ohm, is connected to a generator whose internal impedance 50 + j25 ohms. Assuming that the peak voltage of the generator is 2V and the impedance of the dipole, excluding loss resistance, is 73 + j42.5 ohms, find the power
a. supplied by the source(real) b. radiated by the antenna c. dissipated by the antenna.

1B. The normalized radiation intensity $U_n(\theta)$ of an antenna is symmetric, and it can be approximated by: 1 for $0^O \le \theta < 30^O$; $\text{Cos}(\theta)/0.866$ for $30^O \le \theta < 90^O$; 0 for $90 \le \theta \le 180^O$ and it is independent of ϕ. Find the:
a. Exact directivity by integrating the function
b. Approximate Directivity using Kraus Formula
c. Find the maximum effective aperture area for above values, if operating frequency is 900 MHz (4+6)

2A. Starting from fundamentals derive the expression for fields & radiation resistance of an infinitesimal Electric dipole.

2B. A horizontal λ/50 infinitesimal dipole of constant current and length *l* is placed parallel to the y-axis a distance h = 0.707λ above an infinite electric ground plane. Find all the nulls formed by the antenna system in the $\phi = 90^O$ plane. (7+3)

3A. Starting from fundamentals derive the expression for array factor, First Null beam width & Half power beam width for a "N" element End fire array of isotopic point sources, with uniform amplitude and spacing.

3B. Design a five element Dolph-Tschebyscheff array with d = 0.5λ and side lobes which are 20 dB below the main beam. (6+4)

4A. For a small circular loop of constant current, starting from fundamentals, derive the expression for far fields.

4B. Derive vector wave equation in terms of electric vector potential and also obtain its solution. (5+5)

5A. Sketch current distribution in linear dipoles for: (a) $l << \lambda$ (b) $\lambda/2 < l < \lambda$ (c) $\lambda < l < 3\lambda/2$

5B. Write explanatory notes on (a) Yagi-Uda antenna (b) Microstrip antenna

5C. Explain Duct propagation. (3+4+3)